COMMENTS TO THE PROPOSED CHANGES TO THE DCPRS CERTIFICATION STANDARDS

A. TIMING ACCURACY

There are a number of issues to be addressed:

FIRST: We recommend this requirement be reduced to at least 0.25 seconds or greater for the following reason. If a temporary GPS outage occurs, the transmitter must maintain its clock using an embedded time base. This is a fact you have to contend with even if the specification is not changed. To meet this newly proposed requirement for a reasonable period of time, Oven Controlled Crystal Oscillators would probably have to be used but we believe this is out of the question because they pull a lot of standby current especially at low temperatures. Today's TCXOs could provide up to about 100-hours (about 4-days) of operation before the 0.1 second limit would be reached. Now, since the flag word tells you if the clock has been updated since the last transmission, the user would be alerted that something went wrong with GPS reception. But they would probably wait to see if this problem continues before sending someone to the DCP site to investigate. Therefore, we believe the user should be afforded more time to react before they begin stepping on another user and losing their data and other users data. Probably a little over a week would be acceptable to the users. Therefore, a 0.25 second lower limit (amounting to about 10-days) would be more practical.

SECOND: We still have to contend with the issue of "Leap Second" updates. Since it is never guaranteed when these will occur, the GPS receiver must be turned on from its standby mode for at least 12.5 minutes before each transmission to insure the successful download of the GPS Almanac. Otherwise, as soon as this occurs, the user will be instantly out of spec by at least 0.9 seconds. Moreover, turning the GPS receiver on is once again a current drain on the battery system. Does anyone have a solution for this problem?

THIRD: This is a minor point but the issue about inhibiting transmissions if the time base has shifted 0.2 seconds (or what ever other limit is finally established) seems rather confusing. If you did not have access to a GPS temporarily you would have to extrapolate (on the conservative side) the amount of time you would continue to transmit based on your internal time base oscillator. You do not know how far you are off from UTC. If you do have access to GPS then this requirement goes away because if you know your clock is off by 0.2 seconds you would obviously correct it before you make the transmission rather than just inhibiting transmissions. In the former, the transmitter manufacturer would have to show by analysis that they had selected the appropriate period of time to safeguard against exceeding the 0.2 seconds. In the latter, it seems to us, it is a mute point.

B. MESSAGE FORMAT

PREAMBLE: Short vs. Long preambles is only defined for 100 BPS. Is that what is being proposed here? The only opportunity for modifying the preamble for 300 or 1200 BPS is in the length of the CW portion. Surely we are not talking about dropping both HDR CW portions to the shorter length of 0.25 seconds. This would affect the acquisition performance.

BIT 4 IN FLAG WORD: No problem with this.

JUST A SUGGESTION: If we do end up adopting many of these proposed changes, perhaps we could identify an FSS which would distinguish between the current system and the proposed system. That way, the receivers could support both without changes to the transmitters (e.g., Backward compatibility).

ANOTHER SUGGESTION: If we end up having to upgrade the firmware in the transmitters, perhaps we can define an FSS which has a better autocorrelation function particularly when embedded between what comes before and after the FSS.

MESSAGE LENGTH FIELD: We agree with others that a field to indicate the length of a message gives no advantages particularly in light of the extended flush bits which can do nothing but increase the probability of detection for the EOT. If the users need this, they can place it in the data message field of the transmission. This could be automatically done by a data logger for instance.

C. DATA SCRAMBLING

This is just a correction to the wording. Very Good!

D. ENCODER FLUSH

We understand why this is being asked for but see no purpose because there are alternative ways to detect the end of message besides the EOT even under low C/N. Nevertheless, we would not argue to not implement it except if Interleaving remains a requirement. The interleavers are fixed block lengths. One bit into the next block and you transmit the entire block. This is not very conducive to what we believe is the intention of the changes and that is to increase the capacity of the system.

E. INTERLEAVER

We support deleting the requirement for the interleaver.

F. PROHIBITED CHARACTERS

We support eliminating requirement to screen for all previously prohibited characters except, obviously, the EOT. In the binary mode, some substitution technique similar to what we presented at the last meeting in March 2004 will be needed. This can be left to the data source (i.e., data logger for example) or to the transmitter. If it is the transmitter, we all have to agree on the appropriate algorithm. We would not all have to agree necessarily if this requirement was placed on the data source.

G. EOT

Adding 32nd bit missed in specification. Good Eye!

H. MAXIMUM MESSAGE LENGTH

We do not think you should delete this definition in a separate area of the spec. It just makes it easier, in our view, to know what the limits are under this heading. It should be made clear to the users that if interleaving remains, this number must be adjusted to stay within the maximum transmission time because the ID, the Flag Word, the EOT and the Flush bits are all interleaved along with the message data.

I. TRANSMIT FREQUENCY ADJUSTMENT

Deleting this requirement is o.k. if we can agree the frequency stability (Item L) is acceptable.

J. RF POWER OUTPUT

The minimum requirement is needed to set the lower limit for closing the Link for an acceptable BER. The maximum level is needed to insure all users receive acceptable portions of the downlink power for the same reason, and that we do not have a case where a user can "hog" the downlink power and thereby reduce the link margin for other users.

The user should not have to worry about whether or not their data gets through (Of course the User's data is important!). We the communication equipment providers should insure that all user data gets through the link with the highest probability. I can not imagine a hydrologist or a meteorologist or a firefighter wanting to worry about at what level they should set their uplink power. Besides, we think it is not a good idea to allow users to be controlling their transmitter power. I think the GOES DCP Transmitter Certification Officer would agree with that.

K. OPERATING FREQUENCY REQUIREMENTS

Given that there is a proposal to relax the Long Term Frequency Stability (Item L) and also a desire to settle on a frequency plan where there is not an unaligned relationship between the 300 frequency plan and the 1200 frequency plan, we suggest we shift to 750 Hz for the 300 BPS channels and 2250 (3 x 750) for the 1200 BPS channels. With the current frequency plan the 1200 channel center frequencies are half way between two 100/300 channel center frequencies. If we switch to 750 and 1500 then we will have a similar misalignment. With a 750 and 2250 split we would have the center frequency of the 1200 BPS channels aligned with the center frequency of every third 300 BPS channel starting with 300 BPS channel number 2. The 100 BPS channels would now be the odd channel since it still requires the 1.5 KHz channel. On the other hand if we went with a 750 and 1500 split then the 1200 and 100 BPS channels would share the same center frequencies and the 300 BPS channel would be the odd channel centered between two 100/1200 channels.

We support the 750/2250 channel split because eventually the 100 BPS will be eliminated. Either way this is all software. Our transmitter can support either with a software upgrade. But we need to be cognizant of the final Long Term Frequency Stability (Item L).

Maybe a bigger question is, "has the loading analysis taken into account the doubling of the capacity on the satellite its affects on not only the Wallops receive site but also DRGS terminals.

L. LONG TERM FREQUENCY STABILITY

The current spec addresses both long term and temperature effects. The long term is specified at +/- 0.5 PPM. The temperature effects are limited to an additional +/-0.5 PPM. This is a total of +/- 402 Hz. This obviously would be unacceptable if the channel spacing is reduced. With the proposed channel spacing, the system will support at least a +/- 100 Hz shift. We believe this number should be as large as possible so as not to impact cost. Our current transmitter can easily support this requirement considering also the need to address the possibility of temporary GPS outages and the requirement for Timing Accuracy (Item A).

M. MODULATOR STABILITY

Combined with next requirement.

N. PHASE NOISE

No issue with this requirement, however, for DRGS designers carrier phase noise and modulation statistics should be separated.

O. NARROW BAND TRANSMIT SPECTRUM

Whether we settle on an SRRC filter or some other filter, we should all insist that the explicit equation for the transfer function of the filter be specified. This is necessary to optimize the end-to-end performance (transmitter to receiver). It is unfortunate that we may have to change the filter but If we must change, we would support an SRRC filter with $\alpha = 1$. In any case, the filter transfer function needs to be specified, which is not the case in the current spec.

Suggest this be split into two requirements. First the "REQUIRED TRANSMIT SPECTRUM FILTER" and second the "NARROWBAND TRANSMIT SPECTRAL MASK" which should be accompanied by a Spectral Mask Limits Graph.

P. MID-BAND TRANSMIT SPECTRUM

The proposed requirement would reduce the spurious levels from the current system. We recommend not changing this requirement. If our requirement is more stringent than the NTIA then we have met their requirements.

Q. FAIL-SAFE

The failsafe limit should allow for a safety margin. The minimum required without the safety margin is obviously dependent on the Maximum Message Length (Item H). We have no problem with the current message lengths either in our transmitter or our DRGS receiver.

R. DCPI LINK

If all DCP sites must be equipped with a DCPI capability, all we see here is a huge cost to the system to be paid for by the users.

S. TEST NOTES

Comments later.

T. OTHER

Possible other changes could be:

1. More modern FEC techniques such as LDPC (Low-Density-Parity-Check Codes) or Turbo Codes which approach the Shannon limit better than any other codes. This could add significantly more margin to the system than 3dB.

2. Change the FSS sequence to one which has a much better autocorrelation response. This could improve acquisition performance. Current FSS contains a high side lobe when you consider the data which comes before and after the FSS.

General Comment to the user community: The nature of the proposed changes discussed above can be supported by our current transmitter with only a software update. Some of the parameters proposed are already supported. These upgrades can be accomplished via our RS-232 interface.